**NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ DATE:\_\_\_\_\_\_\_\_\_\_\_\_\_ PER.\_\_\_\_\_\_\_\_**

**OBSERVING OSMOSIS**

**Background**

Osmosis is the diffusion of water across a semi-permeable membrane, from an area of high concentration of water to an area of low concentration of water. Water moves in and out of a cell depending the amount (concentration) of solutes in a cell, resulting in 3 types of solution causing the cell to either swell, shrink or stay the same. These solutes are water-soluble or can be dissolved by water. Cells placed in an **isotonic** solution have an equal amount of water and particles on either side of a membrane and, therefore, the cell’s mass will not change over time. A cell placed in a **hypertonic** solution will shrink because there is more water inside the cell than outside the cell. So, water will move out of the cell causing the cell to shrink and lose mass over time. This is what happens when a plant is not watered – the cells all shrink, causing “plasmolysis” or “wilting”. When a cell is placed into a **hypotonic** solution, the cell will swell. There is more water outside the cell than inside the cell so water will move into the cell, causing it to swell and gain mass over time. In plants, this is called “turgor pressure” and makes the plant stand up straight. This also causes cells to be “plump”.

Osmosis is used in food preservation. Many civilizations “dried” meat in order to preserve it. This meant that large quantities of salt were put on the meat, causing all of the water to flow out and “dehydrating” the meat. This makes it so that no micro-organisms can grow in the meat. This is the whole idea about “dehydrated” foods and it is also why water must be added to “dehydrated” foods.

In this lab, you will observe osmosis over a period of time using decalcified eggs. The eggs have been soaked in vinegar which causes the calcium in the shell to dissolve, leaving only the membrane on the egg. You will be placing your eggs in one of two liquids – One egg will be placed in a beaker of de-ionized water. Remember that we use de-ionized water so we do not introduce anything else, BUT water. The other egg will be placed in a beaker of syrup. You will then weigh the egg every 10 minutes for a total of 40 minutes and then calculate the change in mass over time. You will use the following formula to calculate the percent mass change for your eggs:

**(mass of egg AFTER being immersed – the INITIAL mass of the egg)**

**X 100**

**INTIAL mass of the egg**

**\*\*\*\*NOTE – REMEMBER YOU DO ALL THE MATH PROBLEMS IN THE PARENTHESIS FIRST, THEN DIVIDE BY THE MASS OF THE EGG AND FINALLY MULTIPLY BY 100.**

**Pre-lab Questions**

1. What does “water-soluble” mean?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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2. In the procedure, you are told to “blot” the egg with a paper towel before weighing the egg.

Why is this imporant?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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3. List 3 differences between the de-ionized water and the syrup (think of what is in each of

them). \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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4. What data will you record in Table 1? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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5. What data will you record in Table 2? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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6. What data will you record in Table 3? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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7. Why do you need to weigh each egg BEFORE you put them into the solutions? \_\_\_\_\_\_\_\_\_\_

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8. What is the Independent variable? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is the Dependent variable? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Materials**

2 – 500 ml beakers 1-scale 250 ml of syrup

2 – decalcified eggs 1 – spoon calculator

2 – pieces of paper towel 2 – gloves clock

2 – weighing containers 250 ml of water graph paper

**Procedure**

1. Get two decalcified eggs and place them in your plastic weighing containers – **BE VERY CAREFUL WHEN HANDLING THESE EGGS AS THEY HAVE NO SHELL.**

a. Label one weighing container “**syrup**” and one container “**water”**

2. Carefully blot the eggs and then take their mass using the scale **(DECIDE WHICH EGG WILL GO INTO WATER AND WHICH WILL GO INTO SYRUP).**

3. Record the mass of the **egg for the water in Data Table 1** and mass of the **egg** to go in the **syrup in Data Table 2** under the **“initial mass”** heading.

4. Pour 250 ml of de-ionized water into one beaker and 250 ml of syrup into the second beaker.

5. Record the appearances of the liquids in **Data Table 3**.

6. Take you egg that you choose to use in the water and place it in the beaker of water. Note the time that the egg went into the water and add 10 mins to that time. **Record this in Data Table 1. See Figure 1 below.**

7. Take the egg that you choose for the syrup and place it in the beaker of syrup. Note the time that the egg went into the syrup and add 10 mins to that time. **Record this in Data Table 2.**

**See Figure 1 below.**

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8. At the end of the 10 minutes, remove the egg**,** carefully remove the egg from beaker and **blot the excess liquid from the surface and weigh the egg**. Place this in data table 1 or 2, respectively in the “After 10 mins” column. **See Figure 2 below.**

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9. Repeat steps 6-8 for each egg for a total of 40 mins. Be sure to record your data in the proper tables. **Egg in water is Data Table 1** and **Egg in syrup is Data Table** **2**!!!

**\*\*\*\*\*NOTE – IT IS A GOOD IDEA TO STAGGER WHEN YOU PUT THE EGGS INTO THE LIQUID. THIS WAY YOU WILL HAVE A COUPLE OF MINUTES TO WEIGH YOUR EGGS AND RETURN THEM TO THE LIQUIDS.**

10. Record the final appearance of the liquids in **Data Table 3**.

11. Wash all equipment with soap and water and wipe tables down with the sponges.

12. Calculate the percent mass change using the formula from page 2 and record this in the proper Data Table.

13. Create a multi-line graph to show the % mass change over the period of time. Remember Independent Variable goes on the x-axis and Dependent Variable goes on the Y-axis – refer to your Graphing Reference Notes.

**Analysis**

**DATA TABLE 1: Egg in Distilled Water Initial Mass:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

|  |  |  |
| --- | --- | --- |
| **Time (minutes)** | **Mass (g)** | **% Mass Change** |
| In \_\_\_\_\_\_\_\_ Out \_\_\_\_\_\_\_\_\_ | After 10 mins.\_\_\_\_\_\_\_\_ |  |
| In\_\_\_\_\_\_\_\_ Out\_\_\_\_\_\_\_\_\_\_ | After 20 mins.\_\_\_\_\_\_\_\_ |  |
| In\_\_\_\_\_\_\_\_ Out\_\_\_\_\_\_\_\_\_\_ | After 30 mins.\_\_\_\_\_\_\_\_ |  |
| In\_\_\_\_\_\_\_\_ Out\_\_\_\_\_\_\_\_\_\_ | After 40 mins.\_\_\_\_\_\_\_\_ |  |

**DATA TABLE 2: Egg in Distilled Syrup Initial Mass:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

|  |  |  |
| --- | --- | --- |
| **Time (minutes)** | **Mass (g)** | **% Mass Change** |
| In \_\_\_\_\_\_\_\_ Out \_\_\_\_\_\_\_\_\_ | After 10 mins.\_\_\_\_\_\_\_\_ |  |
| In\_\_\_\_\_\_\_\_ Out\_\_\_\_\_\_\_\_\_\_ | After 20 mins.\_\_\_\_\_\_\_\_ |  |
| In\_\_\_\_\_\_\_\_ Out\_\_\_\_\_\_\_\_\_\_ | After 30 mins.\_\_\_\_\_\_\_\_ |  |
| In\_\_\_\_\_\_\_\_ Out\_\_\_\_\_\_\_\_\_\_ | After 40 mins.\_\_\_\_\_\_\_\_ |  |

**DATA TABLE 3: Appearance of Liquids**

|  |  |  |
| --- | --- | --- |
| **Liquid** | **Initial** | **Final** |
| **De-Ionized Water** |  |  |
| **Syrup** |  |  |

**Conclusion**

1. Which egg gained mass over time? Why did this egg gain mass?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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2. Should the egg from question #1 gained mass over time? Why or why not? \_\_\_\_\_\_\_\_\_\_\_\_\_

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3. Which egg lost mass over time? Why did this egg lose mass?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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4. Should the egg from question #3 lost mass over time? Why or why not? \_\_\_\_\_\_\_\_\_\_\_\_\_

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5. Describe any changes that occurred in the appearance of the liquids. Why might these

changes happen?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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6. What type of solution was each egg placed in? How do you know? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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7. Would you expect the same results if you used eggs that had not been decalcified? Why or

why not?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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8. Why is it important that a cell membrane be semi-permeable (also known as selectively

permeable)? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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9. Why is osmosis important in human cells? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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10. In the past, meat was preserved by packing it in salt. Explain how this technique might have

prevented meat from spoiling. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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